INSTRUCTOR'S GUIDE

AN INNOVATIVE "ME-TOO" IDEA: PREMARKET NOTIFICATION—510(K) MEDICAL DEVICE SUBMISSIONS

INTRODUCTION

FDA's premarket notification, 510(k), process is the most common regulatory path for the clearance of medical devices within the Center for Devices and Radiological Health (CDRH). This case study uses a fictitious hip implant system to illustrate FDA's 510(k) submission requirements. The purpose of the case study is to teach students the regulatory process using a hip implant as an example; therefore, some technical details of the hip implant are provided. Instructors should always focus on the regulatory process rather than the technical aspects of the product.

Because a number of regulations and guidance documents are included in this case study, we suggest instructors familiarize themselves with all materials presented (videos, readings, and additional references) in order to deliver the information effectively to students. Students are responsible for reviewing videos and mandatory reading materials before class. These materials provide the details of essential concepts in the case study. The optional reading materials will be helpful for in-class discussions and other assignments. Additional references are provided for further exploration of regulatory concepts and approaches.

Instructors can use the case study and references as a springboard to focused discussions on a regulatory topic (design validation, biological evaluations, clinical trials, etc.), a coordinated course (e.g., design controls for a medical device), or a more advanced regulatory science curriculum.

LEARNING OBJECTIVES

1. To understand the "substantial equivalence" decision-making process for a 510(k) submission.
2. To examine the 510(k) submission processes as a whole.
3. To prepare a traditional 510(k) (a write-up of some key sections of a submission) in a team project.

TOPICS

Predicate device; substantial equivalence; 510(k) submission process

ASSUMPTIONS

The case study is based on the following assumptions:

- Target audience is undergraduate/graduate students who have little or no experience in medical device development.
- Users of the case study are instructors who have some basic knowledge about FDA.
- Instructors may spend three class sessions teaching the materials, including student presentations.

Instructors should—

- Be proficient with the reference materials listed.
- Be proficient in searching FDA's Web site and using it for class demonstrations, particularly, FDA's medical device databases.
- Instruct students to obtain hands-on experience searching FDA's Web site.
- Dedicate sufficient preparation time for class lecture.

- Provide the case study materials to all students, preferably 2 weeks before class.
- Prepare, engage, and immerse students in the lessons learned from the case study.
- Justify the substantial equivalence decision-making process applied to the suggested product differentiation ideas of a hip implant system.
- Prepare appropriate presentation slides using the case study and reference materials as necessary.

SUGGESTED APPROACH

1. Preparing Students (Session 1): Students are required to review all the appendices and the background of the case, and complete all readings and other assignments before each class session.
2. Engaging Students (Session 2): This session is a lecture on the 510(k) submission process, and uses a hip implant medical device as an example. Class activities include team discussions and instructor demonstrations on the determination of SE.
3. Immersing Students (Session 3): This team project is a mock-up submission of some key sections of a 510(k) application using suggested examples or a medical device of the team's choice.

STUDENT ACTIVITIES

SESSION 1

Instructors should direct students to review all of the following materials before the first class session, and may elect to test students at the beginning of this session on their preparation via a quiz.

I. Review the following materials before Session 1:

1. CDRH Learn Videos

The following video presentations provide background knowledge on FDA's regulatory processes.

a. Overview of Regulatory Requirements: Medical Devices

(Approximately 30 minutes)

http://fda.yorkcast.com/webcast/Viewer/?peid=040308365ec8405bad39b06de8561bdc1d

b. Premarket Notification Process—510(k)

(Approximately 1 hour)

http://fda.yorkcast.com/webcast/Viewer/?peid=f59814465f674e59a19f3b61c6880ea81d

http://fda.yorkcast.com/webcast/Viewer/?peid=e0ea02ad4f0c4532a98fa9406caa01d0

http://fda.yorkcast.com/webcast/Viewer/?peid=2360fdf6adf7468aaebd0431ffd76ace

2. Hip Implant Videos

The following video presentations are intended to familiarize students with hip implant technology and its associated use. Instructors should not spend too much time or effort on the technology, but instead emphasize how FDA's regulatory process can be applied to the hip implant. For example, a class discussion should focus on justifications for a specific regulatory pathway due to a change in the material used for a femoral stem design rather than focus on material science.

a. Explanation of Different Hip Implant Designs

(Approximately 5 minutes)

http://www.youtube.com/watch?v=k-QOqOayBUQ

b. Hip Replacement Surgery: PreOp Patient Education

(Approximately 6 minutes)

http://www.youtube.com/watch?v=YsVIn5JaCmc

c. Total Hip Replacement Surgery: Animation Video

(Approximately 2 minutes)

http://www.youtube.com/watch?v=YrSmlwNWAmQ

3. Mandatory Reading

The following materials provide an overview of substantial equivalence, the key concept for students to learn in this case study.

Note: Draft guidance is subject to change and is not for implementation.

a. The 510(k) Program: Evaluating Substantial Equivalence in Premarket Notifications

http://www.fda.gov/downloads/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/UCM284443.pdf

b. "Substantial Equivalence" (SE) Decision-making Documentation

http://www.fda.gov/downloads/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm082205.pdf

4. Optional Reading

The following materials may help students understand other concepts related to the 510(k) process. Instructors are encouraged to teach these concepts.

a. General/Specific Intended Use

http://www.fda.gov/downloads/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm073945

b. Use of Standards in Substantial Equivalence Determinations

http://www.fda.gov/downloads/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm073756.pdf

II. Answer the following questions before Session 1—Fundamental concepts:

1. Describe the intended use of the 22 mm femoral head.

http://www.fda.gov/downloads/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm073945.pdf

The elements of intended use of the 22 mm femoral head are listed in Table 1 in the case study. Instructors may also reference other 510(k) summaries of safety and effectiveness for comparison.

2. How do you justify that the premarket notification, 510(k), submission is the correct regulatory pathway for the 22 mm femoral head?

   http://www.fda.gov/MedicalDevices/DeviceRegulationandGuidance/HowtoMarketYourDevice/PremarketSubmissions/PremarketNotification510k/default.htm

   MSO, Inc. has legally marketed three almost identical femoral heads. The new femoral head has the same intended use and, it is highly likely, the same technological characteristics as the other three femoral heads. The only difference is the diameter of the new femoral head. This new product has three predicates; therefore, a 510(k) submission is feasible.

III. Additional references

These references provide supplemental information to the case study. Instructors are encouraged to teach these concepts as time permits.

1. The Federal Food, Drug, and Cosmetic (FD&C) Act:

   http://www.fda.gov/RegulatoryInformation/Legislation/FederalFoodDrugandCosmeticActFDCAct/default.htm

2. Sub Chapter II – Definitions § 321. Definitions [p. 32, paragraph (h)]:

   http://www.gpo.gov/fdsys/pkg/USCODE-2010-title21/pdf/USCODE-2010-title21-chap9-subchapII-sec321.pdf

SESSION 2

I. Review the following materials before Session 2:

1. Hip Replacement Surgery Videos

   Warning: The following videos present live surgical operations and contain graphic images that may be disturbing to some viewers. Viewer discretion is advised.

   a. Total Hip Replacement Video Part 1

      (Approximately 5 minutes)

      http://www.youtube.com/watch?v=lh2UX8gQnBM

   b. Total Hip Replacement Video Part 2

      (Approximately 5 minutes)

      http://www.youtube.com/watch?v=YFQ7haTbN0g

2. Mandatory Reading

   Note: Draft guidance is subject to change and is not for implementation.

   a. The Preparation of Premarket Notification for Ceramic Ball Hip Systems

      http://www.fda.gov/downloads/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm080786.pdf

   b. Submission and Review of Sterility Information in Premarket Notification [510(k)] Submissions for Devices Labeled as Sterile

      http://www.fda.gov/downloads/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm072790.pdf

3. Optional Reading

   a. Nonclinical Information for Femoral Stem Prostheses

      http://www.fda.gov/downloads/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm075223.pdf

II. Questions for in-class discussion (instructor guidance required)

Substantial equivalence (SE) is the key concept of a 510(k) submission. Instructors should spend ample time explaining the decision-making process detailed step by step in Table 2 in the case study. The supplemental diagram in the Appendix contains additional details that may help instructors better describe the process outlined in Table 2 in various scenarios.

It is beneficial for students to see how the SE decision-making process is followed. Prior to the team discussion, instructors are encouraged to use additional example(s) of other medical device(s) to demonstrate each step of the SE decision process outlined in Table 2 and in the supplemental diagram. Instructors may use the following examples to explain the SE decision-making process in addition to other devices that they have detailed information for or a product they are familiar with. Instructors may use the following tables or construct a similar 510(k) "Substantial Equivalence" Decision-making Process diagram or use both methods to explain the following examples to the class.

1. Using the Table 2 format in the case study, discuss the SE decision-making process for each scenario:
    a. A porous coating on the tibial baseplate of a knee system is a well-understood technology in other orthopedic implants. One company's 510(k) submission proposes applying the same coating to a subject femoral stem for biologic fixation purposes. Additional tests are performed to demonstrate that the coating is fit for the intended fixation (See Table A in the Appendix). Testing should be performed according to the modified metalic surface guidance document:

        http://www.fda.gov/downloads/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm081247.pdf

    b. A 510(k) submission proposes introducing a new bone screw with a larger diameter into a company's product line. All materials and processes used in manufacturing are the same. (See Table B in the Appendix)
    c. A different alumina matrix composite material has been used to create a ceramic femoral head similar to the alumina BIOLOX forte. This new BIOLOX forte composite material is not a well-understood technology. A 510(k) submission proposes using the new material to create a ceramic femoral head prosthesis like the BIOLOX forte. Additional tests are performed and different failure modes are identified. (See Table C in the Appendix)

II. In-class group discussion

For this discussion, students may be divided into teams of three to five members. Each team should have a facilitator to lead the discussion and a scribe to record the key points of the discussion. The information discussed may be used for the eventual team project.

In this group exercise, students will take on the roles of scientists or engineers working in Dr. Develp's research and development group. All students are required to actively participate in the team discussion. Each team will address one of the assigned perspectives below using the product differentiation plan scenario outlined in the case study with the understanding that the goal here is not to prove substantial equivalence, but to conceptualize a new device for MSO, Inc. using FDA regulatory guidance. Instructors may need to obtain a copy of the ISO 21535 Standard to guide the Team B discussion.

Dr. Develp has decided to pursue his product development strategies for MSO, Inc. He divided his research and development group into four teams to help him develop a hip implant system for patients who have an active lifestyle:

1. Team Alloy (Team A) is responsible for addressing the biocompatibility concerns associated with using a new treatment chemistry process for the alloy used in the new femoral neck and stem. The team may discuss other concerns such as fatigue strength, etc., if time allows.
2. Team Claim (Team B) is responsible for developing the product claim by addressing patients "who have an active lifestyle" in the indications for use statement. Students in this group should think in detail about the intended population (age, level of everyday activity, etc.).
3. Team Corrosion (Team C) is responsible for discussing corrosion in the implant (how corrosion would impact patient health and possible solutions). Students should refer to American Society for Testing and Materials (ASTM International) standards for guidance: ASTM F1875-98(2009) Standard Practice for Fretting Corrosion Testing of Modular Implant Interfaces: Hip Femoral Head-Bore and Cone Taper Interface

   http://www.astm.org/Standards/F1875.htm

Corrosion may likely occur inside the taper connection after a prolonged period of implantation. The corrosion that occurs at the interface between contacting, highly-loaded metal surfaces when subjected to slight vibratory motions is known as fretting corrosion. Fretting corrosion may be greatly reduced when the contacting surfaces can be well lubricated or separated by corrosion inhibitors, such as other non-metal materials or protective coatings. There are also other types of corrosion to consider. Corrosion resistant design should always be practiced for implants because the by-products of corrosion may exist as micro particles or become toxic to the surrounding tissues.

ASTM International has published various corrosion and wear standards. These standards provide procedures for carrying out corrosion, wear, and abrasion tests on specified metallic materials and alloys. These tests are conducted to examine and evaluate the behavior, susceptibility, and extent of resistance of certain materials to stress corrosion. Corrosion testing should be an integral part of nonclinical engineering testing.

III. Additional references:

Clinical study is not a required discussion topic in this case study; however, there are occasions in which clinical data may be required to demonstrate SE for a 510(k) submission. Therefore, instructors are encouraged to briefly review and discuss this topic, which may be relevant for the team project.

Note: Draft guidance is subject to change and is not for implementation.

1. Biological Evaluation of Medical Devices Part 1: Evaluation and Testing

   http://www.fda.gov/downloads/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/UCM348890.pdf

2. Clinical Data Presentations for Orthopedic Device Applications

   http://www.fda.gov/downloads/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm072283.pdf

3. ISO 21535 Non-Active Surgical Implants—Joint replacement implants —Specific requirements for hip-joint replacement implants

SESSION 3: STUDENT PROJECT AND PRESENTATION

I. Review the following materials before beginning the project:

The following materials will help students understand hip implant construction and use, and include similar product 510(k) summaries. Instructors may use these examples to further review and discuss the relevant sections of a 510(k) submission.

1. Product example: Accolade®
   a. System Brochure

      http://www.gkqcw.com/admin/uppic/023525.pdf

   b. Accolade® System Surgical Technique

      http://www.emmersivemedia.com/pdf/SurgicalGuideAccoladeII.pdf

2. Safety and Effectiveness Summary examples

The following 510(k) Safety and Effectiveness Summaries provide students with ideas of how requirements are met in a 510(k) submission. Instructors may want to use these examples to explain the project requirements. For example, biocompatibility testing requires specific performance testing to demonstrate SE according to certain sections of ISO 10993 (see item c. below).

   a. PBP Total Hip System Summary of Safety and Effectiveness

      http://www.accessdata.fda.gov/cdrh_docs/pdf12/K122158.pdf

This is an example of a total hip system Safety and Effectiveness Summary. It provides descriptions of what has been completed to fulfill the 510(k) performance testing requirements on femoral stems and heads, and acetabular shells and liners.

   b. Orthocon Aborbable Hemostatic Bone Putty Summary of Safety and Effectiveness

      http://www.accessdata.fda.gov/cdrh_docs/pdf12/K122156.pdf

This brief example of a 510(k) Summary of Safety and Effectiveness discusses bone putty.

   c. Accolade® II Hip Stem 510(k) Summary of Safety and Effectiveness

      http://www.accessdata.fda.gov/cdrh_docs/pdf12/K120578.pdf

This resource provides a brief overview of a 510(k) Summary of Safety and Effectiveness for a femoral hip stem.

3. Refuse to Accept Policy for 510(k)s: Elements for a Complete Submission

   http://www.fda.gov/downloads/medicaldevices/deviceregulationandguidance/guidancedocuments/ucm315014.pdf

4. Format for Traditional and Abbreviated 510(k)s

   http://www.fda.gov/downloads/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm084396.pdf

II. 510(k) Submission Team Project

Instructors should be familiar with The Refuse to accept policy for 510(k)s: Elements for a Complete Submission reference above, and may spend time going through relevant sections (e.g., indication for use statement, device description, substantial equivalence discussion, biocompatibility, and performance) in class. Instructors may choose the level of detail students are required to provide for the project.

Note: This project may be used to satisfy in part a senior or graduate project, or other special academic requirement.

After reviewing the materials above, choose option A or B for your project:

A. Based on your in class group discussion, prepare the following sections of a 510(k) submission for the MSO hip implant:

- Indication for Use Statement

  Refer to "Statement of Indications for Use" section:

  http://www.fda.gov/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm080275.htm

  To access the IFU form, use the following link:

  http://www.fda.gov/downloads/AboutFDA/ReportsManualsForms/Forms/UCM360431.pdf

- Device Description

  See Chapter II, Section 11 of "Guidance for Industry and FDA Staff Format for Traditional and Abbreviated 510(k)s updated November 17, 2005" document:

  http://www.fda.gov/downloads/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm084396.pdf

- Substantial Equivalence Discussion (describe how your team would follow the steps in Table 2)

  Refer to "Guidance on the CDRH Premarket Notification Review Program 6/30/86 (K86-3)" document:

  http://www.fda.gov/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm081383.htm

And one of the following sections:

- Biocompatibility

  Note: Draft guidance is subject to change and is not for implementation.

  http://www.fda.gov/downloads/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/UCM348890.pdf

- Performance Testing – Bench

  See Chapter II, Section 18 of "Guidance for Industry and FDA Staff Format for Traditional and Abbreviated 510(k)s"

- Performance Testing – Animal

  See Chapter II, Section 19 of "Guidance for Industry and FDA Staff Format for Traditional and Abbreviated 510(k)s"

- Performance Testing – Clinical

  See Chapter II, Section 20 of "Guidance for Industry and FDA Staff: Clinical Data Presentations for Orthopedic Device Applications":

  http://www.fda.gov/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm072263.htm

B. Using the prompts above, prepare four sections of a 510(k) submission for a medical device design project or a medical device prototype of your choice.

III. Additional references

Note: Draft guidance is subject to change and is not for implementation.

1. Biological Evaluation of Medical Devices Part 1: Evaluation and Testing

   http://www.fda.gov/downloads/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/UCM348890.pdf

2. FDA Decisions for Investigational Device Exemption (IDE) Clinical Investigation

   http://www.fda.gov/downloads/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/UCM279107.pdf

3. Information on Premarket Approval (PMA)

   http://www.fda.gov/MedicalDevices/DeviceRegulationandGuidance/HowtoMarketYourDevice/PremarketSubmissions/PremarketApprovalPMA/default.htm

APPENDIX

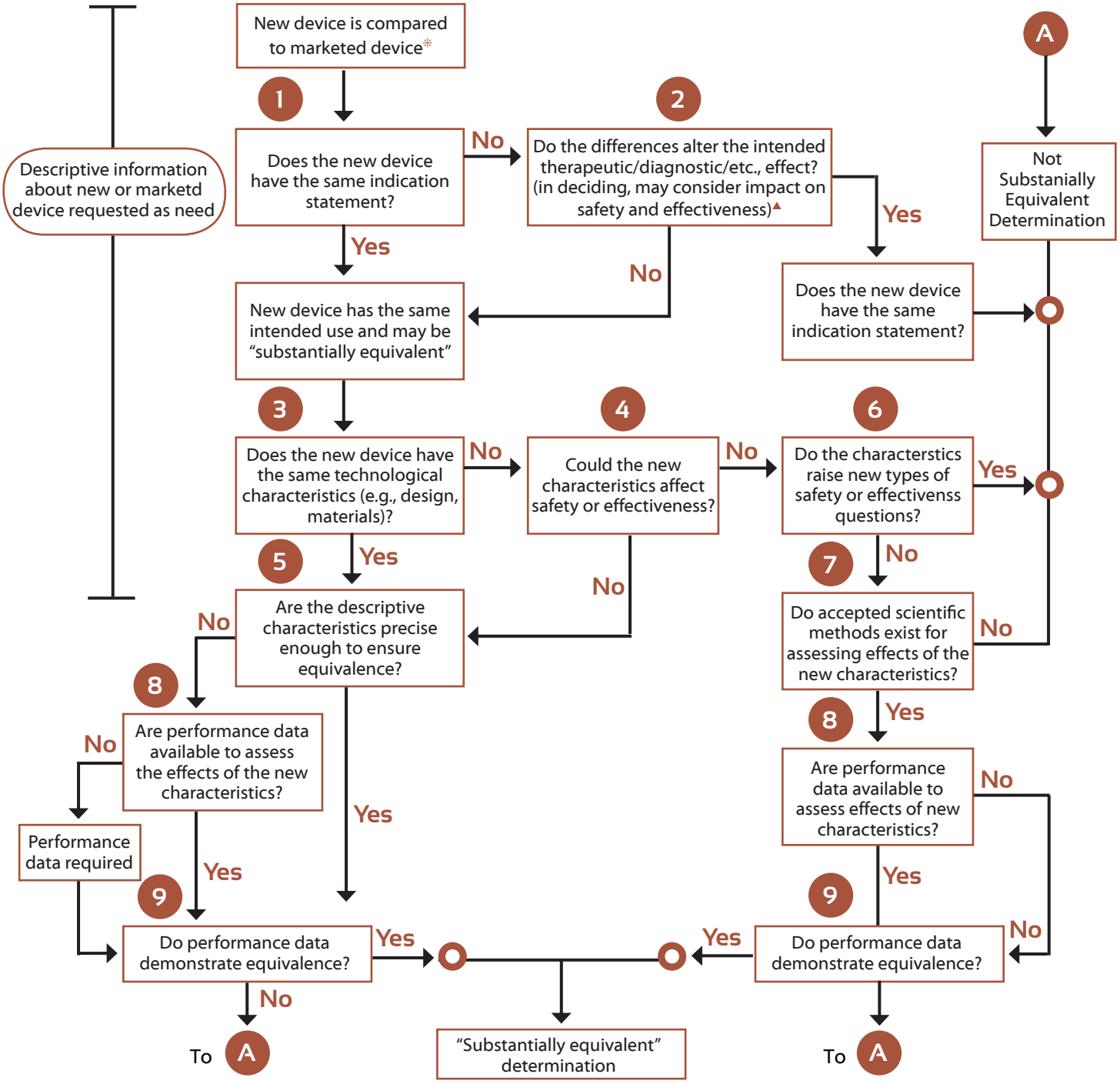
Table 2. 510(k) "Substantial Equivalence" Decision-Making Table

(Students are required to explain and justify each step of the process.)

Step	Description	YES	NO	Next Step
1	Is the product a device?			If YES = Go to next step If NO = Stop
2	Is the device subject to 510(k)?			If YES = Go to next step If NO = Stop
3	Does the new device have the same indication statement as the predicate?			If YES = Go to 5 If NO = Go to next step
4	Do differences in the indication statement raise new issues of safety or effectiveness?			If YES = Stop → NSE If NO = Go to next step
5	Does the new device have the same technological characteristics as the predicate?			If YES = Go to 7 If NO = Go to next step
6	Could the new technological characteristics affect safety or effectiveness?			If YES = Go to 8 If NO = Go to next step
7	Are the descriptive characteristics precise enough to ensure equivalence?			If YES = Stop → SE If NO = Go to 10
8	Are there any new types of safety or effectiveness questions?			If YES = Stop → NSE If NO = Go to next step
9	Are there any accepted scientific methods that exist?			If YES = Go to next step If NO = Stop → NSE
10	Are performance data available?			If YES = Go to next step If NO = Request Data
11	Do the data demonstrate equivalence?			If YES = Final decision → SE If NO = Stop → NSE

SE = Substantial Equivalent; NSE = Not Substantial Equivalent

Supplemental Diagram: 510(k) "Substantial Equivalence" Decision-making Process



* Comparison is done for the subject device that the company is intending to seek clearance for to a predicate device, then the intended use and technological characteristics are examined. ▲ The decision is normally based in descriptive information alone, but limited testing information is sometimes required.

Note: The first and second steps in Table 2 of the case study are not shown in this diagram; therefore, Step 1 in this diagram corresponds to Step 3 in Table 2.

Table A. Femoral Stem Coating SE Decision-making Table

Step	Description	YES	NO	Next Step	Comments/Justification
1	Is the product a device?	✓		If YES = Go to next step If NO = Stop	
2	Is the device subject to 510(k)?	✓		If YES = Go to next step If NO = Stop	
3	Does the new device have the same indication statement as the predicate?	✓		If YES = Go to 5 If NO = Go to next step	
4	Do differences in the indication statement raise new issues of safety or effectiveness?			If YES = Stop ⊕ NSE If NO = Go to next step	
5	Does the new device have the same technological characteristics as the predicate?		✓	If YES = Go to 7 If NO = Go to next step	It is a new coating in the femoral stem.
6	Could the new technological characteristics affect safety or effectiveness?	✓		If YES = Go to 8 If NO = Go to next step	The porous coating may have an effect on safety and effectiveness of a hip implant system.
7	Are the descriptive characteristics precise enough to ensure equivalence?			If YES = Stop ⊕ SE If NO = Go to 10	
8	Are there any new types of safety or effectiveness questions?		✓	If YES = Stop ⊕ NSE If NO = Go to next step	No. Because the porous coating is a well understood technology.
9	Are there any accepted scientific methods that exist?	✓		If YES = Go to next step If NO = Stop ⊕ NSE	Methods exist and are the same as the predicate.
10	Are performance data available?	✓		If YES = Go to next step If NO = Request Data	Additional tests are performed to characterize the coating and determine if it affects the fatigue strength of the femoral stem.
11	Do the data demonstrate equivalence?	✓		If YES = Final decision ⊕ SE If NO = Stop ⊕ NSE	

SE = Substantial Equivalent; NSE = Not Substantial Equivalent

Table B. Bone Screw SE Decision-making Table

Step	Description	YES	NO	Next Step	Comments/Justification
1	Is the product a device?	✓		If YES = Go to next step If NO = Stop	
2	Is the device subject to 510(k)?	✓		If YES = Go to next step If NO = Stop	
3	Does the new device have the same indication statement as the predicate?	✓		If YES = Go to 5 If NO = Go to next step	
4	Do differences in the indication statement raise new issues of safety or effectiveness?			If YES = Stop ⊕ NSE If NO = Go to next step	
5	Does the new device have the same technological characteristics as the predicate?	✓		If YES = Go to 7 If NO = Go to next step	Even though the screw diameter is slightly different, similar screws are available in a similar range of sizes. Therefore, technological characteristics are the same.
6	Could the new technological characteristics affect safety or effectiveness?			If YES = Go to 8 If NO = Go to next step	
7	Are the descriptive characteristics precise enough to ensure equivalence?	✓		If YES = Stop ⊕ SE If NO = Go to 10	
8	Are there any new types of safety or effectiveness questions?			If YES = Stop ⊕ NSE If NO = Go to next step	
9	Are there any accepted scientific methods that exist?			If YES = Go to next step If NO = Stop ⊕ NSE	
10	Are performance data available?			If YES = Go to next step If NO = Request Data	
11	Do the data demonstrate equivalence?			If YES = Final decision ⊕ SE If NO = Stop ⊕ NSE	

SE = Substantial Equivalent; NSE = Not Substantial Equivalent

Table C. Alumina Composite SE Decision-making Table

Step	Description	YES	NO	Next Step	Comments/Justification
1	Is the product a device?	✓		If YES = Go to next step If NO = Stop	
2	Is the device subject to 510(k)?	✓		If YES = Go to next step If NO = Stop	
3	Does the new device have the same indication statement as the predicate?	✓		If YES = Go to 5 If NO = Go to next step	
4	Do differences in the indication statement raise new issues of safety or effectiveness?			If YES = Stop ⊕ NSE If NO = Go to next step	
5	Does the new device have the same technological characteristics as the predicate?		✓	If YES = Go to 7 If NO = Go to next step	The femoral head is different from the BIOLOX Forte.
6	Could the new technological characteristics affect safety or effectiveness?	✓		If YES = Go to 8 If NO = Go to next step	The new material has an effect on the safety and effectiveness of the hip implant system.
7	Are the descriptive characteristics precise enough to ensure equivalence?			If YES = Stop ⊕ SE If NO = Go to 10	
8	Are there any new types of safety or effectiveness questions?		✓	If YES = Stop ⊕ NSE If NO = Go to next step	General ceramics have the same "types" of questions with regard to durability, biocompatibility of the material, etc.
9	Are there any accepted scientific methods that exist?	✓		If YES = Go to next step If NO = Stop ⊕ NSE	
10	Are performance data available?	✓		If YES = Go to next step If NO = Request Data	
11	Do the data demonstrate equivalence?	✓		If YES = Final decision ⊕ SE If NO = Stop ⊕ NSE	

SE = Substantial Equivalent; NSE = Not Substantial Equivalent